

REMARKS/ARGUMENTS

Favorable reconsideration of this application, as presently amended and in light of the following discussion, is respectfully requested.

Claims 18-32 are currently pending in this case. Claims 18, 19 and 24 have been amended by the present Amendment. No new matter has been added.

In the outstanding Office Action, the drawings were objected to as failing to comply with 37 CFR §1.84(p)(5) because the element 115 in Fig. 12D was not mentioned in the description. Claims 18-22 were rejected under 35 U.S.C. §102(e) as being anticipated by Applicant's background discussion of the related art (Fig. 12D). Claim 23 was rejected under 35 U.S.C. §103(a) as being unpatentable over Applicant's background discussion of the related art, in view of Japanese Patent 06268178 by Moriyama (hereinafter Moriyama). Claims 24-27 and 30-32 were rejected under 35 U.S.C. §103(a) as being unpatentable over Applicant's background discussion of the related art, in view of U.S. Patent No. 6,297,082 by Lin et al. (hereinafter Lin). Claim 28 was rejected 35 U.S.C. §103(a) as being unpatentable over Applicant's background discussion of the related art and Lin, in view of Moriyama. Claim 29 was rejected 35 U.S.C. §103(a) as being unpatentable over Applicant's background discussion of the related art and Lin, in view of U.S. Patent No. 6,049,113 by Shida (hereinafter Shida).

In response to the objection to drawings, the specification is amended to add description of the element 115 in Fig. 12D. Applicant respectfully submits the objection to drawings has been overcome.

Claims 18, 19, and 24 have been amended to recite that the shallow trench isolation film is doped with impurities. The shallow trench isolation is formed prior to a doping

process. Therefore the shallow trench isolation film is doped with impurities during ion implantation.¹ No new matter has been added.

Applicant respectfully submits that the positively recited feature in independent Claims 18, 19 and 24, that the shallow trench isolation film is doped with impurities, is not disclosed in any of the applied references. In the process described in Applicant's background discussion of the related art, the doping takes place prior to the formation of the shallow isolation trench film, as illustrated in Fig. 12A. In Applicant's disclosed invention, the doping takes place after the formation of the shallow isolation trench. The shallow isolation trench is not covered by the resist patterns during the doping processes (Fig. 1B, 1C). The isolation trench is therefore doped using ion implantation technique.

Applicant respectfully submits that Moriyama fails to disclose a shallow trench isolation doped with impurities, and thus fails to disclose all elements of the claimed inventions. In Fig. 1D, Moriyama shows that impurities (B) are implanted into the semiconductor substrate 11 through the second interlayer insulation film 18, first interlayer insulation film 16, gate electrode 14a, 14b, 14c and gate oxide film 12. However, Moriyama is silent on whether the impurities are doped into an element isolation region or not, such a region not being identified.

Lin likewise does not teach or disclose the shallow isolation trench doping. Lin merely discloses a semiconductor device with a first and a second gate oxide films having different thicknesses. The photoresist layers used during the ion implantation steps have narrow openings above the channels (Figures 2B, 2C, 2D, 2E), so the shallow trench isolation 202 is not doped.

Shida discloses a semiconductor device comprising an NMOS transistor and a PMOS transistor with different gate thicknesses. The device isolation oxide film 5 is formed prior to

¹ See in Specification, page 16, line 18 to page 17, line 8; page 17, line 9 to page 18, line 2; page 23, line 25 to page 24, line 25; figures 1B, 1C, 5A, 5B, 7A, 8, 9A.

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the multiple ion implantation of impurities. The photoresist masks used during ion implantation doping are not shown (Column 6, line 34-41) and Shida is silent whether the impurities are doped into the element isolation region or not, in any of the ion implantation steps. Therefore Shida also fails to cure the above-mentioned deficiency.

Because the references cited in the Office Action, whether considered alone or in combination, do not disclose or suggest all the elements of independent Claims 18, 19, and 24, Applicant respectfully submits that Claims 18, 19, and 24, and all claims depending therefrom, patentably define over the asserted prior art for at least the reasons stated above.²

Consequently, in light of the above discussion and in view of the present amendment, the present application is believed to be in condition for allowance, and an early and favorable action to that effect is respectfully requested.

Respectfully submitted,

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² MPEP § 2142 "...the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991)."